

Soft Systems Methodology

A Walk-Through for Beginners

Soft Systems Methodology is a scientific approach to understanding and improving the world we live and work in based on the work of Peter Checkland and others at the University of Lancaster (Checkland and Poulter, 2006; Checkland and Scholes, 1990).

There are many approaches to carrying out SSM, which can make it difficult for the uninitiated (Armstrong, 2019; Checkland, 2000).

This document aims to provide a basic overview of the steps of SSM so you can start using it as quickly as possible. It is not meant to be comprehensive, nor reflect the developments, extensions, or modifications of SSM throughout the years. Rather, this is one version of SSM that has worked for me.

It contains steps and tasks that you can follow for conducting a basic investigation for research or practice.

Introductory Items: Assumptions about the world you will be investigating

SSM requires taking a fresh look at parts of the world we often take for granted. Specifically, SSM relies on *systems thinking*, seeing the world as a set of interrelated, dynamic parts. When using soft systems thinking, we do not assume that problems exist “out there” in an objective sense, but rather that people may see an issue differently depending on a wide range of factors: their situation, goals, background, etc.

Below are some assumptions that we adopt when conducting SSM that help us capture “the whole picture”.

Systems assumptions to adopt about the world

- ☐ Everything and every person is connected in some way
- ☐ Change is the only constant
- ☐ What we do influences our environment and other people in it AND
- ☐ The environment influences us
- ☐ There is always more than one side to anything

Assumptions to adopt about other people:

- ☐ Our behavior, emotions, and thoughts have causes and therefore can be understood

- ❑ We may not have caused our problems, but it is up to us to solve them
- ❑ Everyone is doing their best

Tips for conducting SSM effectively:

- ❑ Embrace complexity!
- ❑ Look for the “kernel of truth” in what others are saying and feeling
- ❑ Seek dialectically opposed views, pairs, sides

The Steps of Soft Systems Methodology

SSM as originally conceived consists of seven steps. To summarize, these steps guide the researcher from observations about the real world, to imagining an improved, ideal state, and then finally to comparing the imaged state to the real world. By moving back and forth between the ideal and the real, you can learn about what works and what doesn't, and take remedial action to make things better.

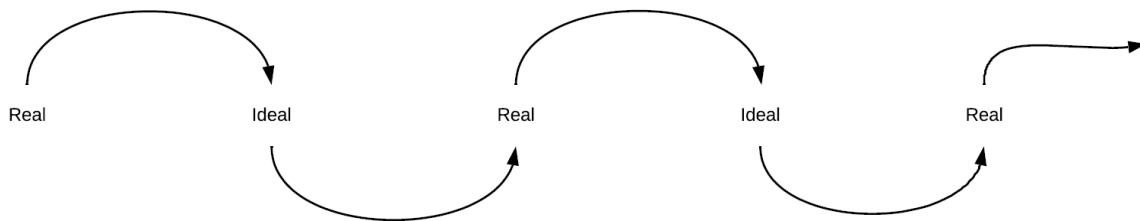


Figure 1: Movements between real and ideal states

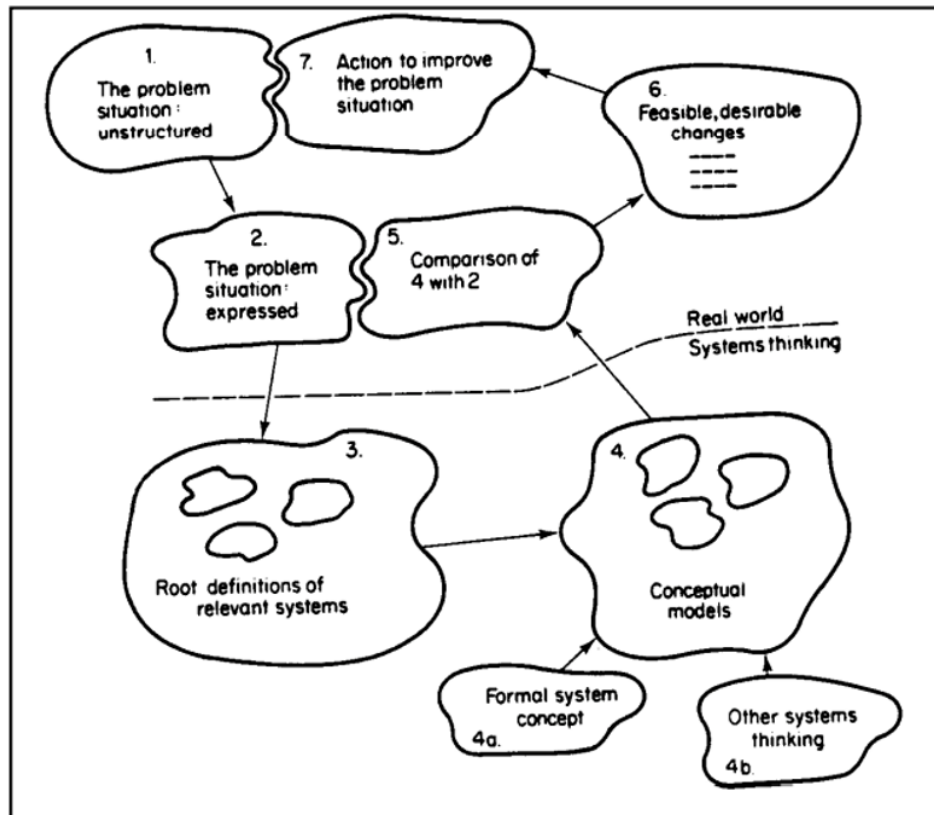


Figure 2: The 7 Steps of SSM. From Checkland & Scholes, 1990, p. 81

This walkthrough will help us practice systems thinking and apply operational concepts to a real-world issue. Specifically, we will be using systems thinking to imagine an ideal way of functioning and compare it to how things actually work. This type of comparison serves as a basis for recommending possible courses of action to improve the real world.

Figure 2 shows the 7 steps, moving from confronting an unstructured problematic situation to defining action steps to improve it. The “systems” part features most heavily in Steps 3 and 4, which provides the language for structuring the problem. In Step 4, we create a systems model that we later compare to the real world.

Checkland found this view of SSM as too restrictive, so it was later represented as in Figure 3. Instead of one comparison, this Figure shows SSM as a never-ending series of comparisons between relevant systems models embedded in a sociopolitical system. This view highlights that the characteristics of the local context conditions what is seen as desirable and feasible.

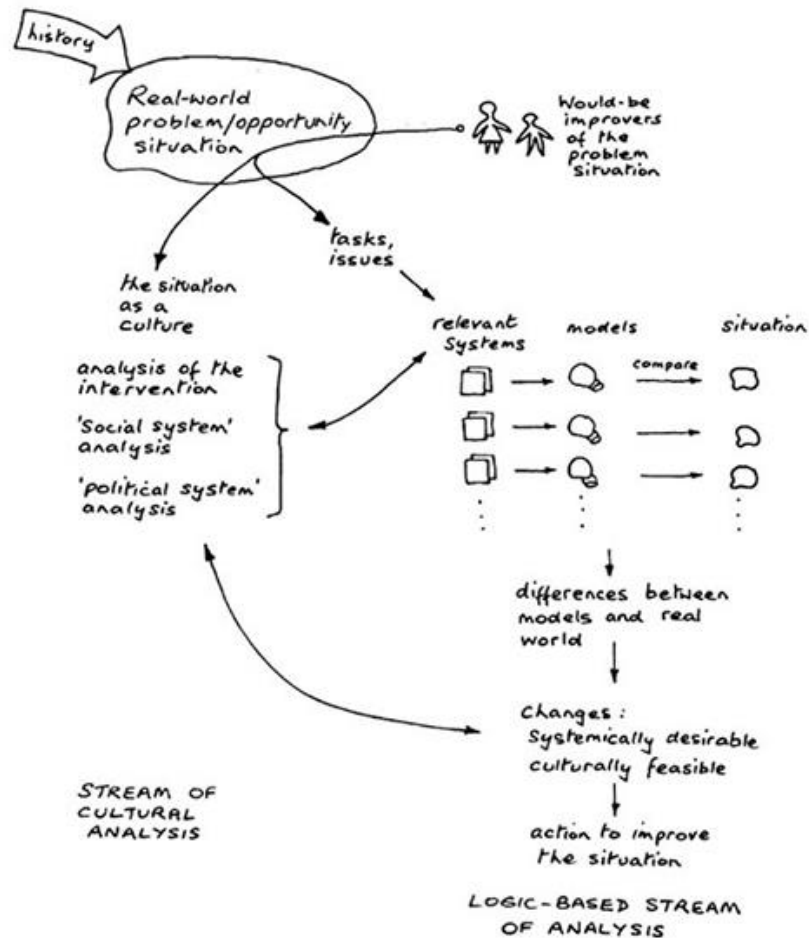


Figure 3: Another way of viewing SSM. Source: Checkland and Scholes, 1990

The rest of this document presents the steps and relevant tasks of this process.

Step 1: Recognize a problematic situation

We begin SSM by identifying a situation we consider needing improvement.

Since absolutely everything can be thought of as a system, everything is open for analysis with SSM. For example, consider a course on Operations Management at the University of Barcelona. We could consider it as “a system for learning operations management”. The course involves many actors: students, faculty, the university, a student’s family. Depending on who you talk to, there might be differing, even conflicting, aspects of the course that need improvement. A student might want less homework, the teacher higher rates of attendance, the family higher prospects of employment upon completion, etc.

It isn’t important that define *exactly* what is going wrong at this point. You will develop a more complete (but never completely complete) evaluation as you progress through the steps.

Tasks for Completing Step 1

Think of an issue or problematic situation for you or someone you know that you would like to analyze. It helps to choose something you have some capacity to change, even if you are not “the boss” or in complete control of the situation. We rarely are, right?

Next, think of a goal you would like to achieve related to the problem situation. Write these down in the space below.

Example:

I will analyze the fact that the dishes in my apartment are always dirty and yet I feel like I’m always cleaning them. My goal would be for the dishes to be clean!

Write the situation you have chosen below.

Step 2: Express the problem situation

Once you have selected a problematic situation, you can begin a deeper investigation.

In order to really define the problem, it’s important to first gather a lot of information. This can be done, for example, by interviewing the people involved and finding and studying a great deal of documentation about the problem. You will want to consider the factors that bring the problem situation about. Finally, it is advisable to gather all information about organizational structure and control processes and to see this in the light of the problem.

The questions below are meant to guide you through Step 2 of soft systems, but you can do more if the situation demands it. For example, it may be that in investigating why there are so many dirty dishes in your apartment, you discover that your roommate Jack has been working long hours and leaving all the dishes he creates at breakfast. That discovery could lead to more questions about why Jack is working longer hours.

Approaches for investigating the problem situation:

- ☐ Interview everyone involved in the problem. Record their responses (get their permission first!)
- ☐ Draw a picture of the problematic situation

- ☐ Use mind mapping or cognitive mapping
- ☐ Keep an observation diary, writing down things that “go wrong”

Tasks for Completing Step 2

Checkland included three analyses into every investigation.

Answer the following questions:

Analysis 1: Examine how the problem situation is being address right now. What is being done? Who is the “problem solver”? What roles can we view the problem situation from?

Example: Dirty Dishes

Right now I’m doing all the dishes while Jack is at work. I suppose we could view the problem from Jack’s perspective, my perspective, and my mother’s perspective (when she comes to visit she thinks it’s gross).

Your Analysis 1:

Analysis 2: Examen the socio-cultural aspects of the problem situation via interacting roles (social positions), norms (expected behavior) and values (by which role-holders are judged).

Example: Dirty Dishes

Roommates should have equal participation in keeping the place clean. Dishes have germs, germs cause disease, and society doesn’t like disease. On the other hand, Jack is a medical student and he is busy fighting disease elsewhere. But then again, I am busy too as a student. Don’t I matter too? I do. I have inalienable rights as a human being, as laid out in the Universal Declaration of Human Rights, 1967.

Your Analysis 2:

Analysis 3: Analysis 3 examines the political (power-related) aspects of the problem situation by spelling these out.

Example: Dirty Dishes

Jack does lots of other things in the apartment, so if I bring up the dishes, he may bring up some of the other chores he does. There isn’t really a mismatch of “power” between us, I don’t think... it’s not like he’s a domineering prick or anything. Really, in most things we’re pretty equal. But it’s true that since this whole virus thing he’s been a little self-inflated. One thing is

true: When my mother comes and sees the dishes it creates tension. She starts nagging me, she asks me interminable questions, and is generally annoying.

Your Analysis 3:

Lastly, attempt to draw, write, or otherwise represent the problem situation after conducting your 3 initial analyses:

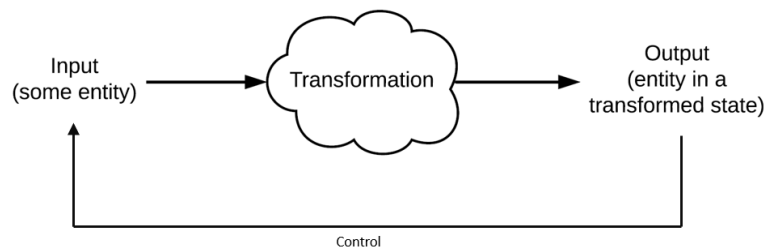
Checklist, Steps 1 and 2:

By the end of Step 2, you should have a good idea of the problem situation you are dealing with. You may have considered some alternative interpretations of the issue, and have represented it in either a drawing, story, or map along with the people you will be working with.

Step 3: Develop Root Definitions

Hopefully, Step 2 has resulted in a more profound understanding of the problem situation. The time has come to begin modeling the ideal functioning of the system. We focus on developing root definitions, a statement of purpose that captures the essence of the relevant system. As shown in Figure 3, we can consider many root definitions in one analysis.

Step 3 is arguably the most technical part of SSM. The object of study in SSM is the system, which Checkland considers in the following way:



Systems can be represented as a number of transformations. These come in the form of:

Some entity -> that entity in a transformed state

Transformations related to doing dishes:

- *Dirty dishes -> clean dishes*
- *Soap -> less soap*

- *A need for socializing -> Need met*
- *A need for reflection time -> time for reflection provided*

But not:

- *Me demanding the dishes are done -> Jack doing the dishes*

In this last example, the arrow represents cause, not transformation. As we will see, representing transformations in this way can be quite restrictive later on.

From the input—output model, we move to creating a root definition. From the root definition, we should be able to plausibly deduce the specific actions required in order to reach the objectives of the system, i.e. the transformation in detail.

We use the acronym CATWOE to help us write powerful root definitions. It stands for Customers – Actors – Transformation process – World view – Owners – Environmental constraints. The CATWOE Analysis makes it possible to identify problem areas, look at what an individual or group wants to achieve, and which solutions can influence the stakeholders.

The following example will walk you through the Step 3.

Doing the dishes:

I begin by revisiting Steps 1 and 2. I decide that the transformation I would like to work on is the one that will provide clean dishes, as this has been bothering me. But it occurs to me that I am also stressed with life in general, and need to relax more. Maybe I will also do a “system for relaxing” analysis.

Doing the dishes CATWOE:

- C – Jack and I are the customers: we are both use the dishes and are both victims of the dirty dishes
- A – Jack, me, my mother. Possibly the landlord. The neighbors, if they can see through the kitchen window.
- T dirty dishes -> clean dishes
- W – People think dishes are a sign of laziness. If the dishes are dirty, what else is wrong with us? Cleanliness is Godliness.
- O – Jack and I are the owners. We could stop doing the dishes.
- E – The size of the kitchen and kitchen sink, limited space in the dishwasher, drying rack. Mother comes every Sunday at noon. I get tired.

I now have enough information to try to write a root definition.

Root definition: A system for having clean dishes

A roommate-owned and manned system for cleaning the dishes, conditioned by available cleaning space and limited by roommate availability, in keeping with the expected standards of human cleanliness, that increases kitchen functionality and enhances well-being.

You can see in the above that I have included an objective (cleanliness for functionality and well-being) and included constraints. These will help me later as I model ideal systems.

Tasks for completing Step 3:

Using the example above for inspiration, try to create a root definition.

What transformations are you dealing with? Write down at least one or two in the lines below:

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Now, perform a CATWOE on your transformation of choice:

Customers	
Actors	
Transformation	
Worldview	
Owner(s)	
Environmental Constraints	

Finally, write a root definition. You can write as many as you like, but only include one transformation for each definition.

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Step 4: Create Conceptual Models

Now you have created a basic definition of what your system does, we move on to creating systemic models of how the system functions. We are squarely in the “ideal” world now, imagining what could be, not necessarily the way things are. The goal of creating conceptual models is to break down the *Transformation* into its essential steps.

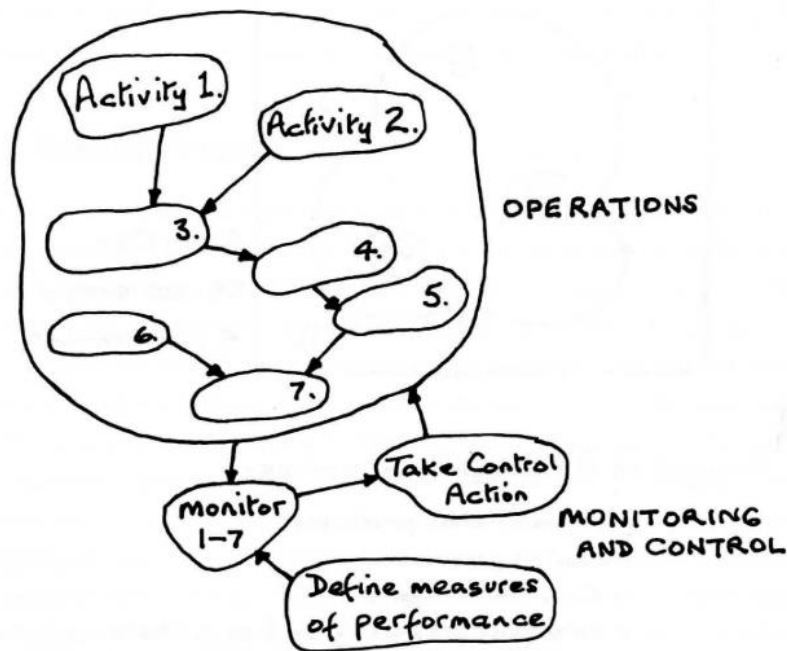


Figure 4: A Generic model for activity systems

There is no “right” way to model, though there are a few approaches that can make it easier. First, recognize that the modelling process is harder than it may first appear. You may need to create several before you arrive at a satisfactory one.

Second, it can be tempting to describe only activities that currently take place. However, it is helpful to remain somewhat abstract, as too much specificity can be limiting. For example, let’s say I describe one of my dish system activities as “Jack puts the dishes in the dishwasher”. It might be useful to say instead “Getting the dishes into the dishwasher”. This allows for more flexibility when redesigning the system as it leaves us free to have either, or even neither, of us actually moving the dishes.

Finally, you will want to include monitoring and taking controlling action. These will allow you to sustain the system and evaluate its performance. There are three types of measures of performance we use: efficacy, efficiency, and effectiveness. These will be described in greater detail below.

Example: A system for having clean dishes

In my dish example, I have come up with 9 activities in the transformation of having clean dishes (Figure 5). This begins with appreciating the need for having clean dishes. While this activity may seem irrelevant or obvious, I realize that Jack may not appreciate the importance of the clean dishes, or may not realize that they result in vexing questions from my mother. Therefore, including it will allow us to evaluate this aspect later.

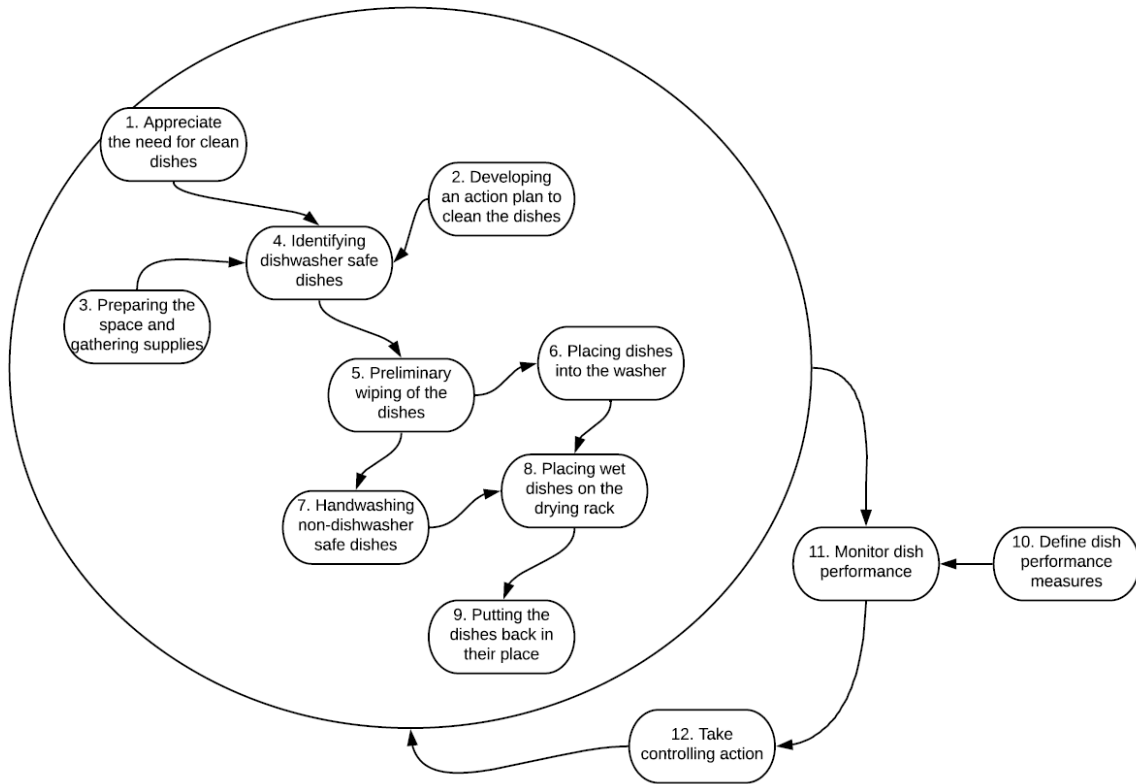


Figure 5: A model of a system for having clean dishes

The rest of the steps I came up with on my own, just by thinking about what we do when we have clean dishes. The numbers are really a bit arbitrary—I include them only to make it easier to refer back to them in other sections.

Note also that I could easily go into more or less detail depending on my needs. If I were to discover, for example, that we frequently run out of dish soap, I would do well to explore Activity 3: *Preparing the space and gathering supplies*. I could even go as far as to repeat the entire process for this activity, developing a system for gathering supplies for washing dishes.

Finally, I have included monitoring and controlling action outside of the system itself. These allow us to evaluate the performance of the system and modify it if needed. An obvious performance measure here could be “number of dishes in the sink” (efficacy). An efficiency measure could be “dishes cleaned” divided by “time spent cleaning dishes”. When it comes to effectiveness, related to higher goals, a good measure might be “reported satisfaction with the kitchen” or “reported sense of peace”. These relate to a perhaps larger system of living.

Tips for model building:

- ☐ Try to keep the number of key activities between 7 and 12
- ☐ If you need more detail, repeat the process for a subsystem. Systems can contain or relate to other systems.
- ☐ Include steps outside the key activities:

- Monitoring the system
- Taking controlling action
- Defining performance measures (the 3 E's)

Tasks for Model Building

- First, try to list the essential activities in your chosen transformation. When you have these, try to draw them in a model (see Figure 5 for an example).
- Next, define some performance measures for your transformation.

How will you know if your system works? (Efficacy). Write down a possible measure for efficacy:

What criteria will you use to know whether the transformation is being achieved with a minimum use of resources? (Efficiency)

What criteria will you use to know whether the transformation is supporting some higher-level or longer-term aim? (Effectiveness)

Step 5: Comparison of model and real-world

Perhaps the most powerful moment of SSM comes from comparing the models of Step 4 with the actual situation “on the ground”. To achieve this, you can use the data you found during the “Finding out” phase, you can use your memory, or you can go out on a fact-finding mission.

Next, compare your observations with the ideal model you created. In comparing, you will likely observe a considerable gap between the imagined model and present reality. You may also have a theory as to why the gap exists that you can note down. Keep in mind that others may have different theories, and keep in mind also that you all may be wrong.

More rarely, you may observe no gap. This would be when you cannot possibly imagine a more perfect present moment. On such rare occasions, celebrate!

Practically speaking, it is helpful to record your comparisons in some fashion. In the task below a table has been provided to carry out this part of the analysis.

Example: A system for having clean dishes

This table below provides a simplified example of a comparison. In practice, it is possible to go into deep analyses of each comparison. I would recommend doing so as long as it remains interesting

and helpful. I would find it less relevant, say to go on a multi-week quest to describe the comparison of “Placing wet dishes on the rack” with reality, for example (unless I was aiming to go into the business of dish racks, maybe!).

Activity	Does it exist?	Comparison notes	Possible Corrective Action (Step 6)
Appreciate the need for clean dishes	Kind of	Jack and I talk about the dishes sometimes. My mother definitely appreciates the need! I’m not	We could meet monthly before my mother comes. We could put some kind of illustration on the fridge Etc., etc.
Developing an action plan for cleaning dishes	Kind of	We never do this, really. Our implicit action plan is “wash the dishes” but we don’t have a schedule.	We could have a schedule! And rewards or punishments for not following it...
Preparing the space and gathering supplies	Yes	Jack normally gets supplies on his weekly trip to the store. The space is fairly messy right now, though, which makes it hard to clean. The worst is when the sink gets full because then no one can wash anything. I call these ‘blockers’ and they cause me great stress	Not sure yet...
Identifying dishwasher safe dishes	Yes	Both Jack and I are good about handwashing things that aren’t meant for the dishwasher. Sometimes we disagree about certain items (like the sharp knives).	Honestly, I think we can live with how this works now. Though maybe a study to establish the effects of the dishwasher on knife sharpness could be fun...

And so forth for the rest of the activities.

Tasks for completing Step 5

In the table below, record the activities for the Model(s) you created in Step 4. If you find you need to revise your model, feel welcomed to do so. SSM models are meant to be fluid!

Activity	Does it exist?	Comparison notes	Possible Corrective Action (Step 6)

(Add a row for each of the activities identified in Step 4)

Steps 6 & 7: Identifying Feasible Changes and Taking Action!

There are many formal ways to identify feasible changes. For an initial project where you live or work with the other actors, a simple but effective way is to simply meet to discuss the project. Obviously, your ability to do this will depend on the sociopolitical context of your study. As the conductor of SSM, one must be conscious of the pros and cons of this change or that, and also of potential risks in involving others in the analysis. A good way to manage this risk is to involve those immediately affected as early as possible.

Importantly, in identifying feasible changes, SSM seeks accommodation, not consensus. Accommodation means finding a solution that all actors can live with. Rarely, accommodation can involve true consensus, meaning all parties agree. However, this is not necessary and in fact, a sign that your root definitions or models may not be radical enough!

One potentially helpful approach is to first brainstorm ideas without censoring and then narrow them down.

For this project, you need not move to Stage 7.

Example: Identifying feasible changes for the dishes

This example goes through the suggested steps for completing Steps 6 and 7.

Sub task 1: Identify as many possible solutions to the dishes as possible. Write anything that comes to mind. Do not evaluate their feasibility or their pros and cons, yet.

1. *Prevent Jack from eating*
 2. *Ban Jack from the kitchen*
 3. *Ban my mother from visiting the apartment*
 4. *I clean everything*
 5. *Jack cleans everything*
 6. *I stop cleaning anything so that the dishes pile up*
 7. *Jack and I have a "state of the apartment" meeting every X days*
 8. *Jack and I have a system of prizes for cleaning the dishes like we get to order pizza*
 9. *Put the dirty dishes in the other person's room*
- Etc. etc.*

It is obvious that some of these ideas will be more effective in increasing efficiency and effectiveness as I have defined them. The next step, therefore, is to evaluate some of the ideas that appear the most promising.

Sub task 2: Answer: Of the ideas above, which do I want to evaluate?

Solution 1: Jack and I have a system of prizes for cleaning the dishes like we get to order pizza

Solution 2: Put the dirty dishes in the other person's room

Sub task 3: Fill out the table below to consider pros and cons

Pros	Solution 1	Solution 2
	<ul style="list-style-type: none">- Makes cleaning more fun- A good excuse to spend quality time together- Positive	<ul style="list-style-type: none">- Very direct- Gets the point across- Likely efficient in terms of effort
Cons	Solution 1	Solution 2
	<ul style="list-style-type: none">- Requires time to plan- Jack might be offended- We may not stick to it- maybe needs to be done in conjunction with weekly meetings	<ul style="list-style-type: none">- Likely does not support general well-being- We might get into fights- Not very hygienic

Sub task 4: Choose a solution to try

Why did you choose this solution? *It seemed like the other one might result in us getting into fights, and fights are bad.*

Fill out the table below with the steps you took (or plan to take) in implementing your solution:

Step	Description	Done?	What happened? (Or what do you expect to happen?)
Chose Solution 1	I decided to try this out and wrote it on my "to-do" list	Yes	Nothing
Proposed it to Jack	I said "hey Jack I have an idea for the kitchen"	Yes	Jack was receptive. I made it about the generally well-being of the apartment. He seemed to understand
Wrote a pilot reward	This week if there are no dirty dishes from	In progress (plan is on fridge)	Both of us felt better. I feel like my issue has been taken seriously.

	either of us we will order pizza		
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Did you reach your goal?

For now, yes. The kitchen is a little cleaner, but mostly I feel better about having talked to Jack.

Is there now a new more pressing problem to be solved? If yes, describe and problem solve.

Not yet. I suppose it remains to be seen.

Tasks for completing Steps 6 & 7

Sub task 1: Identify as many possible solutions to the dishes as possible. Write anything that comes to mind. Do not evaluate their feasibility or their pros and cons, yet.

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Sub task 2: Now narrow down some ideas you'd like to test. Answer: Of the ideas above, which do I want to evaluate?

Solution 1:

Solution 2:

Sub task 3: Fill out the table below to consider pros and cons

Pros	Solution 1	Solution 2
Cons		

Sub task 4: Choose a solution to try

Why did you choose this solution?

Fill out the table below with the steps you took (or plan to take) in implementing your solution:

Step	Description	Done?	What happened? (Or what do you expect to happen?)

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Conclusions

Congratulations! You are well on your way to becoming an SSM expert. I hope you have enjoyed this guide.

References

- Armstrong R (2019) Elaborating a critical realist approach to soft systems methodology. *Systemic Practice and Action Research* 32(4): 463–480. DOI: 10.1007/s11213-018-9466-7.
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